

Directed Energy for Interstellar Study

Completed Technology Project (2016 - 2018)

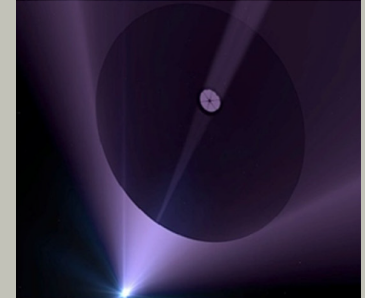


Project Introduction

We propose to expand our investigations started in our NIAC Phase I of using directed energy to allow the achievement of relativistic flight to pave the way to the first interstellar missions. All of the current conventional propulsion systems are incapable of reaching the high speeds necessary to enable interstellar flight. Directed energy offers a path forward that, while difficult, is feasible. It is not an easy path and it does have many milestones to cross in order to get to the point of achieving the speeds needed. Along the roadmap we propose are important and useful waypoints that both allow testing and feed back to the larger design but are also useful for many applications. The consequences of this program are truly transformative not only for achieving relativistic flight for small probes but also for larger spacecraft at lower speeds suitable for rapid interplanetary travel. The Phase II work will consist of refining our roadmap and building and testing a small phased array prototype to test many of the concepts developed in the Phase I. We will also further our work on the wafer scale spacecraft design including work on the critical integrated laser communications system. We will also explore and test the inverse mode of using the array for reception which is critical to receiving the laser communications from the spacecraft.

Anticipated Benefits

All of the current conventional propulsion systems are incapable of reaching the high speeds necessary to enable interstellar flight. Directed energy offers a path forward that, while difficult, is feasible. It is not an easy path and it does have many milestones to cross in order to get to the point of achieving the speeds needed. The consequences of this program are truly transformative not only for achieving relativistic flight for small probes but also for larger spacecraft at lower speeds suitable for rapid interplanetary travel.



Artist rendering of the Directed Energy Interstellar Study.
Credits: P. Lubin

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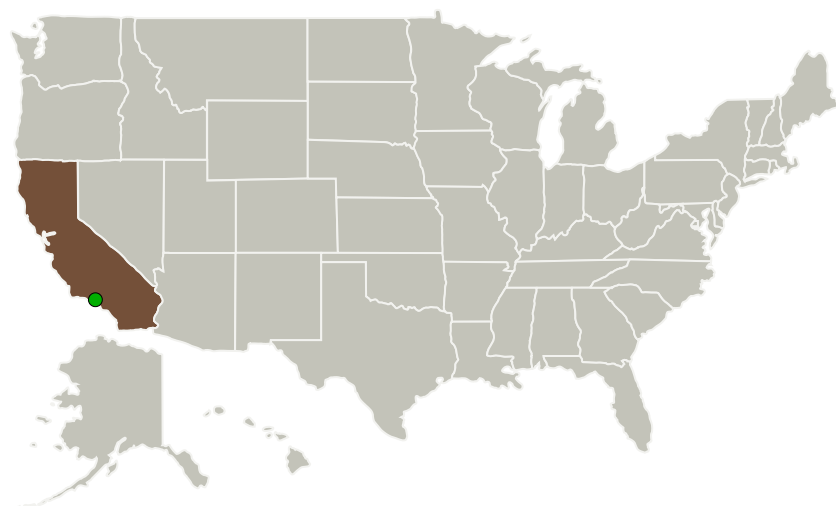
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Primary U.S. Work Locations and Key Partners



Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of California-Santa Barbara (UCSB)

Responsible Program:

NASA Innovative Advanced Concepts

Project Management

Program Director:

Jason E Derleth

Program Manager:

Eric A Eberly

Principal Investigator:

Philip M Lubin

Co-Investigators:

Mark K Pryor
John J Bowers
Gary D Hughes
Forrest D Brewer
Peter R Meinhold

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Organizations Performing Work	Role	Type	Location
University of California-Santa Barbara(UCSB)	Lead Organization	Academia Asian American Native American Pacific Islander (AANAPISI), Hispanic Serving Institutions (HSI)	Santa Barbara, California
California Polytechnic State University-San Luis Obispo(Cal Poly)	Supporting Organization	Academia	San Luis Obispo, California
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
Massachusetts Institute of Technology Lincoln Laboratory(MIT-LL)	Supporting Organization	R&D Center	Lexington, Massachusetts
Tethers Unlimited Inc	Supporting Organization	Industry	
University of California-Berkeley(Berkeley)	Supporting Organization	Academia	Berkeley, California

Primary U.S. Work Locations

California

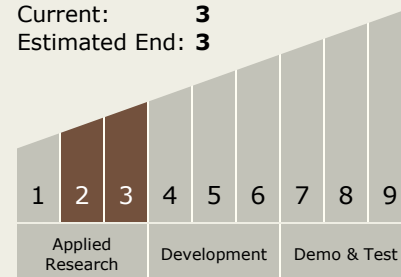
Project Transitions



June 2016: Project Start

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.4 Advanced Propulsion
 - TX01.4.4 Other Advanced Propulsion Approaches

Target Destination

Outside the Solar System

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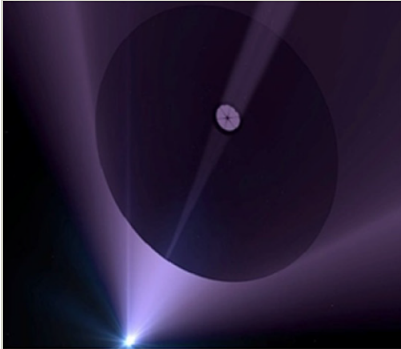
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May 2018: Closed out

Closeout Link: <https://www.nasa.gov/feature/directed-energy-interstellar-study>

Images



Project Image

Artist rendering of the Directed Energy Interstellar Study. Credits:

P. Lubin

(<https://techport.nasa.gov/image/102095>)

Links

NASA.gov Feature Article

(<https://www.nasa.gov/feature/directed-energy-interstellar-study>)